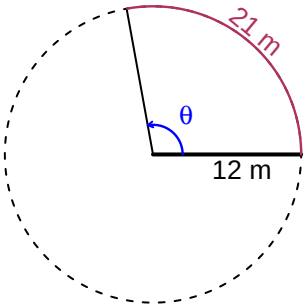
Name: Date:

Trig Final (Solution v39)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 12 meters. The arc length is 21 meters. What is the angle measure in radians?

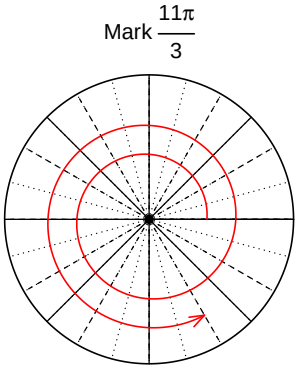


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

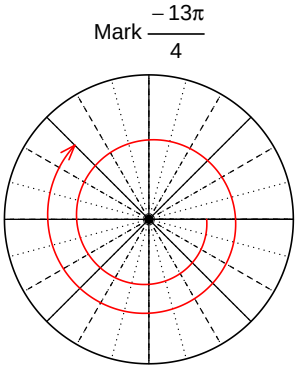
$\theta = 1.75$ radians.

Question 2

Consider angles $\frac{11\pi}{3}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{3}\right)$ and $\sin\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(11\pi/3)$



Find $\sin(-13\pi/4)$

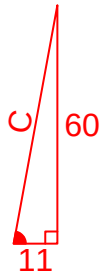
$\cos(11\pi/3) = \frac{1}{2}$

$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{60}{11}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

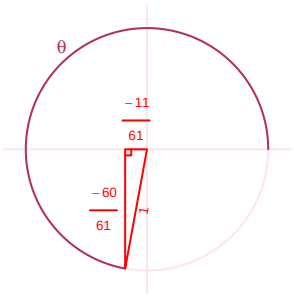
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$11^2 + 60^2 = C^2$$
$$C = \sqrt{11^2 + 60^2}$$
$$C = 61$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-60}{61}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 6.68$ meters, an amplitude of 3.22 meters, and a frequency of 5.18 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.22\cos(2\pi 5.18t) + 6.68$$

or

$$y = 3.22\cos(10.36\pi t) + 6.68$$

or

$$y = 3.22\cos(32.55t) + 6.68$$